



2005 Natural Gas Market Assessment

Workshop on Natural Gas Market Assessment 2005 Reference Case

in support of

2005 IEPR

Natural Gas Office

July 14, 2005



Topics for the Morning Session

- Natural gas demand projections
- NARG modeling framework
- Natural gas supply and resource base assumptions and results
- Natural gas infrastructure implications
- Discussion on preliminary reference case



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Overview of Analysis and Approach: **Process**

- Several workshops held to discuss input, assumptions and model details
- This workshop will present the results on the Preliminary Reference Case. Input from Parties will provide the Committee with information to make appropriate changes to assumptions and provide basis for the *Final Reference Case*
- Policy issues will be discussed in the afternoon session
- Input from this workshop will be considered by Committee for inclusion in the final reference case.
- Assumptions and results will be presented by the following order:
 - Demand - Lynn Marshall and Mark Digiovanna
 - Modeling framework - Leon Brathwaite
 - Supply - Mike Purcell
 - Infrastructure - Bill Wood
 - Prices - Mark Digiovanna



Natural Gas Demand Projections

- In the past, the natural gas office incorporated natural gas demand projections developed by the Demand analysis office (for California only) and other national sources for other regions
- 2003 IEPR and subsequent discussions indicated that demand should consider price elasticity and other economic factors driving demand
- The natural gas office incorporated elastic demand representation in the model in 2005 IEPR process
- Demand Analysis office continues to develop natural gas demand projections as done in the past
- The first section of presentation provides a range of natural gas demand projections for the residential, commercial and industrial sectors in California
- Staff will highlight each method and range of natural gas demand projections for the end-use sectors mentioned above



Committee Workshop on Natural Gas

Staff Presentation
End User Demand Forecast
July 14, 2005



Demand Forecast Overview

- Staff Electricity and Natural Gas Demand Forecasts
 - *CED 2006-2016 Staff Energy Demand Forecast and Energy Demand Forecast Methods Report*
 - Electricity demand forecast used to develop the UEG demand for the natural gas market assessment
 - Natural Gas End User forecasts includes core, noncore, and publicly owned utilities, but no cogeneration or UEG
- Methodology
 - End use models for residential, commercial, and industrial sectors
 - Econometric models for ag. & water pumping
 - Annual energy consumption of electricity and natural gas are forecasted jointly by sector and utility planning area



Staff Forecast Assumptions & Key Drivers

- Residential Sector:
 - DOF Population & staff households projections
 - Building & Appliance Standards Impacts
 - Prices- Staff Natural Gas Price Projections (based on October 2004 NARG run)
- Commercial Sector:
 - Projections of additions to commercial floorspace based on historic averages
 - Prices
 - Building and Appliance Standards Impacts



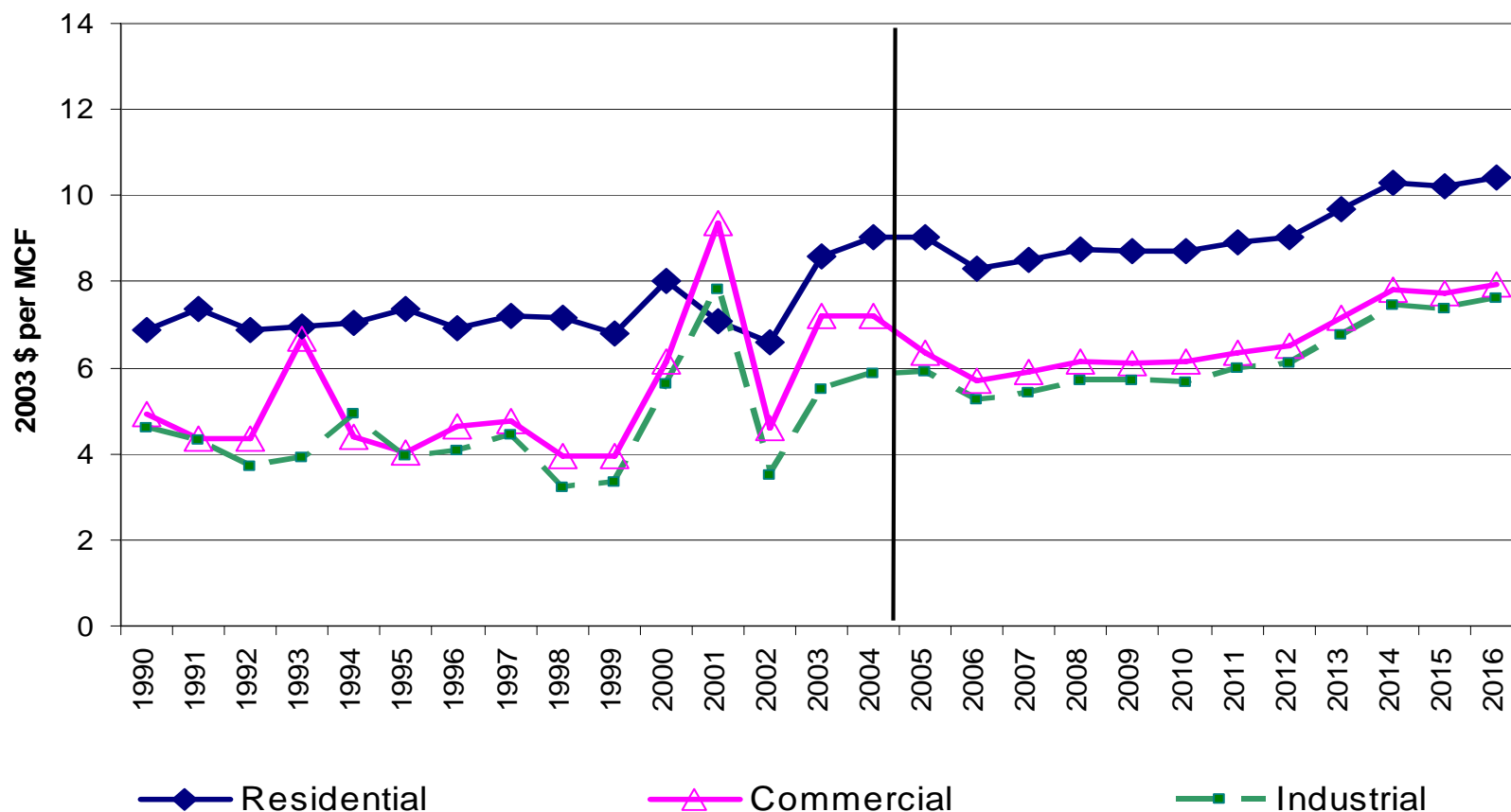
Staff Forecast Assumptions & Key Drivers

- Industrial Sector:
 - Forecast by NAICS group
 - County-level Economy.com value added projections
 - Natural gas and electricity prices
- Mining (including TEOR)
 - Economy.com employment projections
 - Natural gas and electricity prices



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Statewide Average Natural Gas Prices

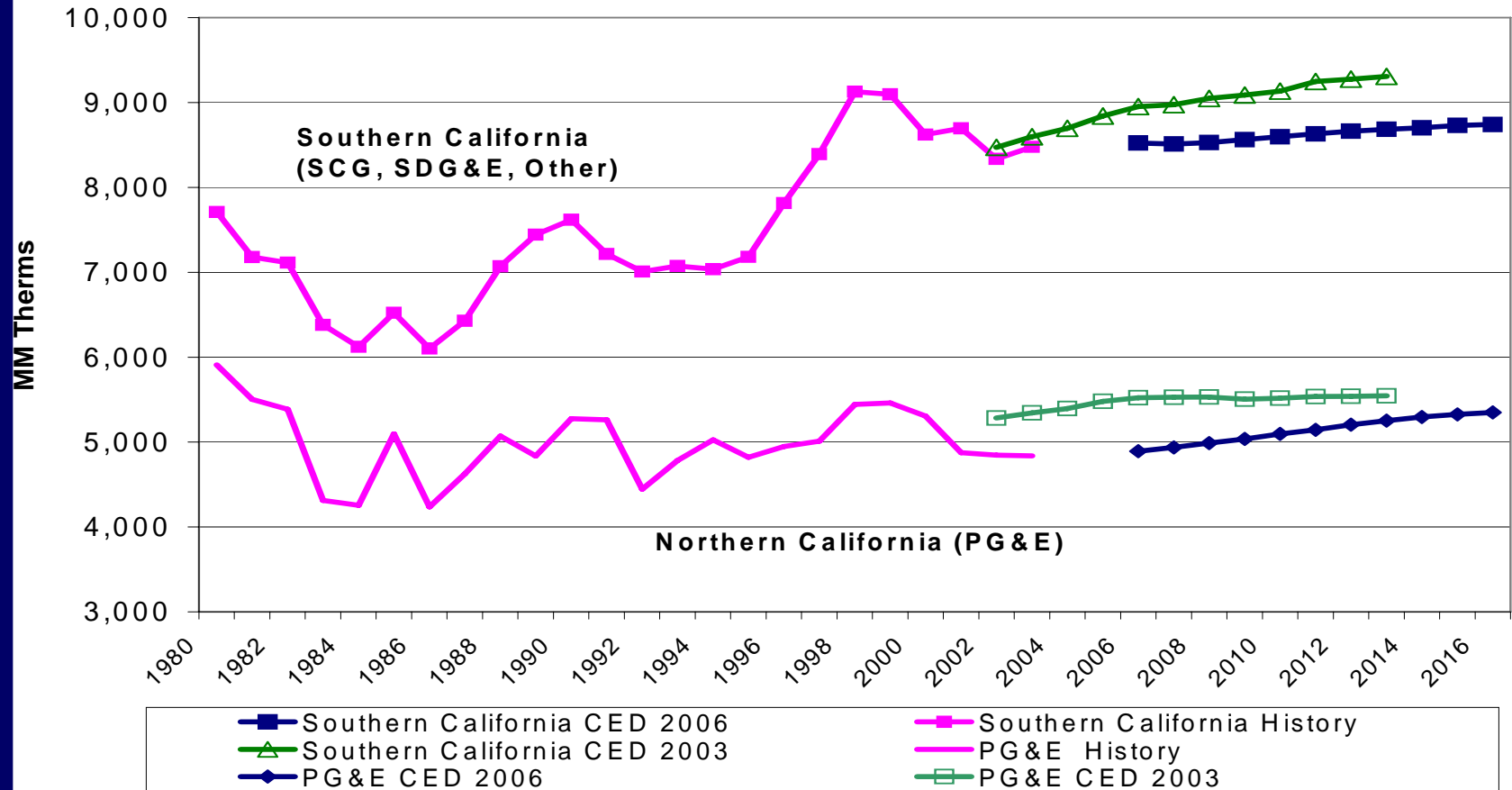


• Forecast based on Oct. 2004 NARG Run



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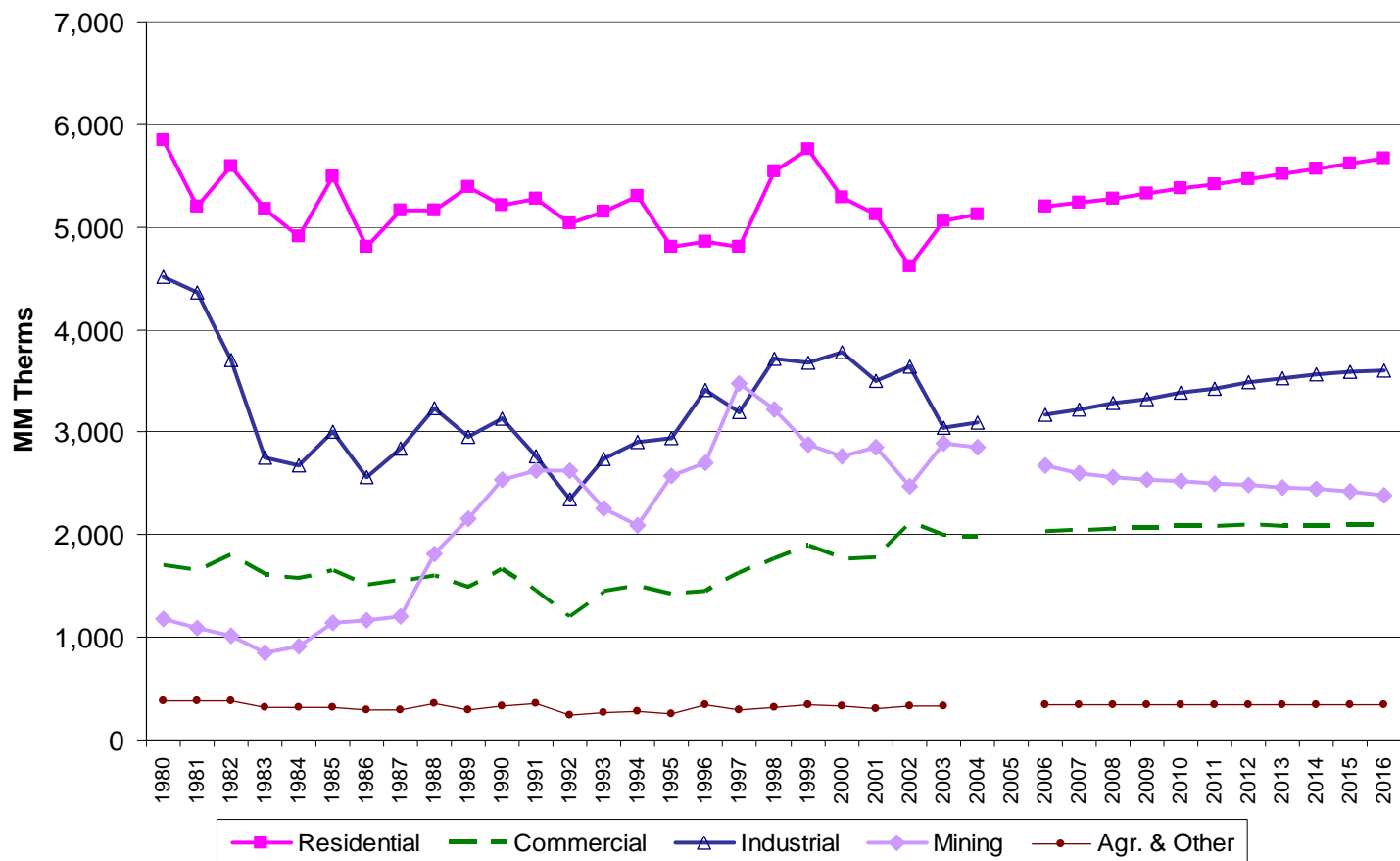
End User Natural Gas Demand





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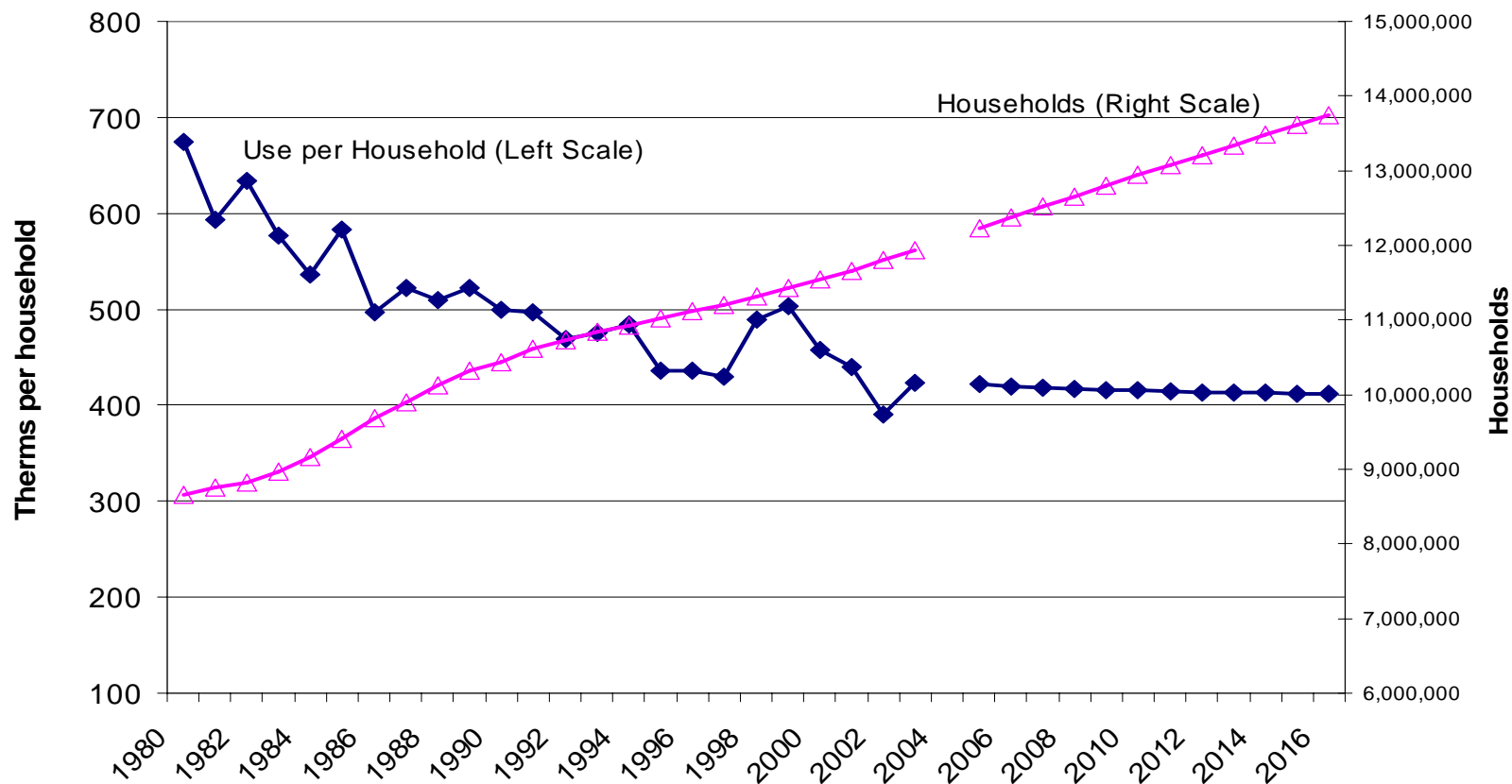
End User Natural Gas Demand by Economic Sector





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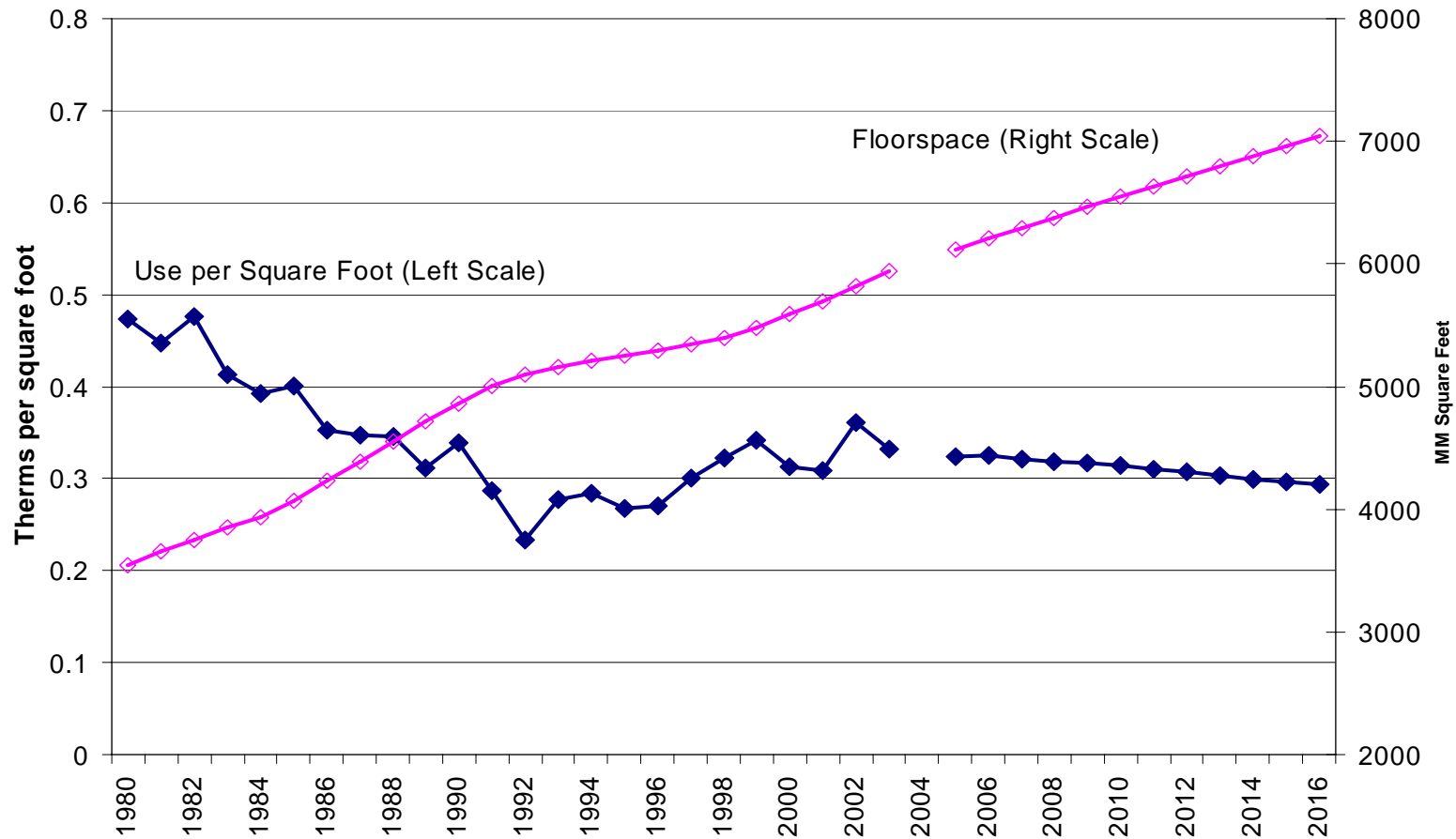
Statewide Residential Natural Gas Use per Household





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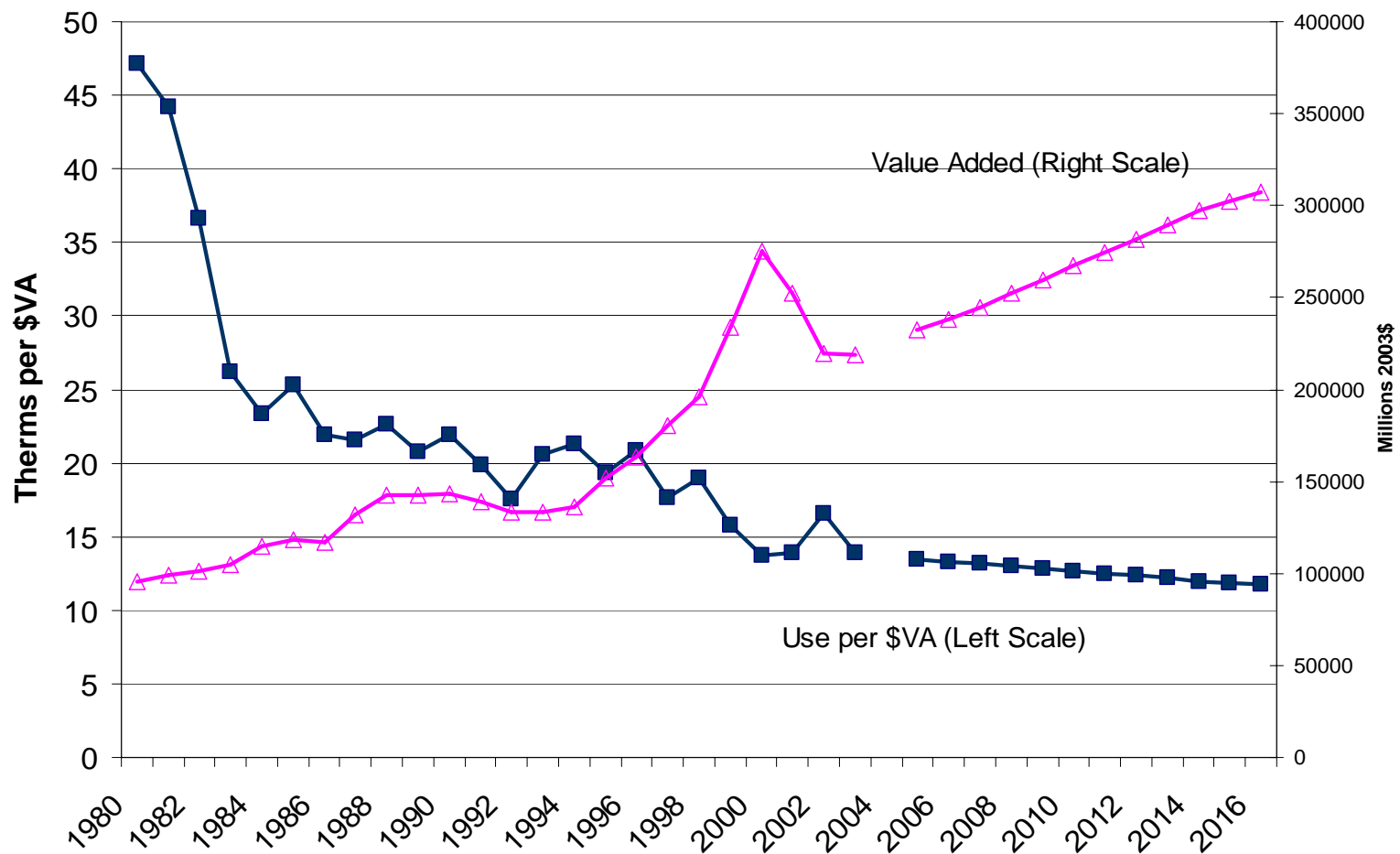
Statewide Commercial Natural Gas Use per Square Foot





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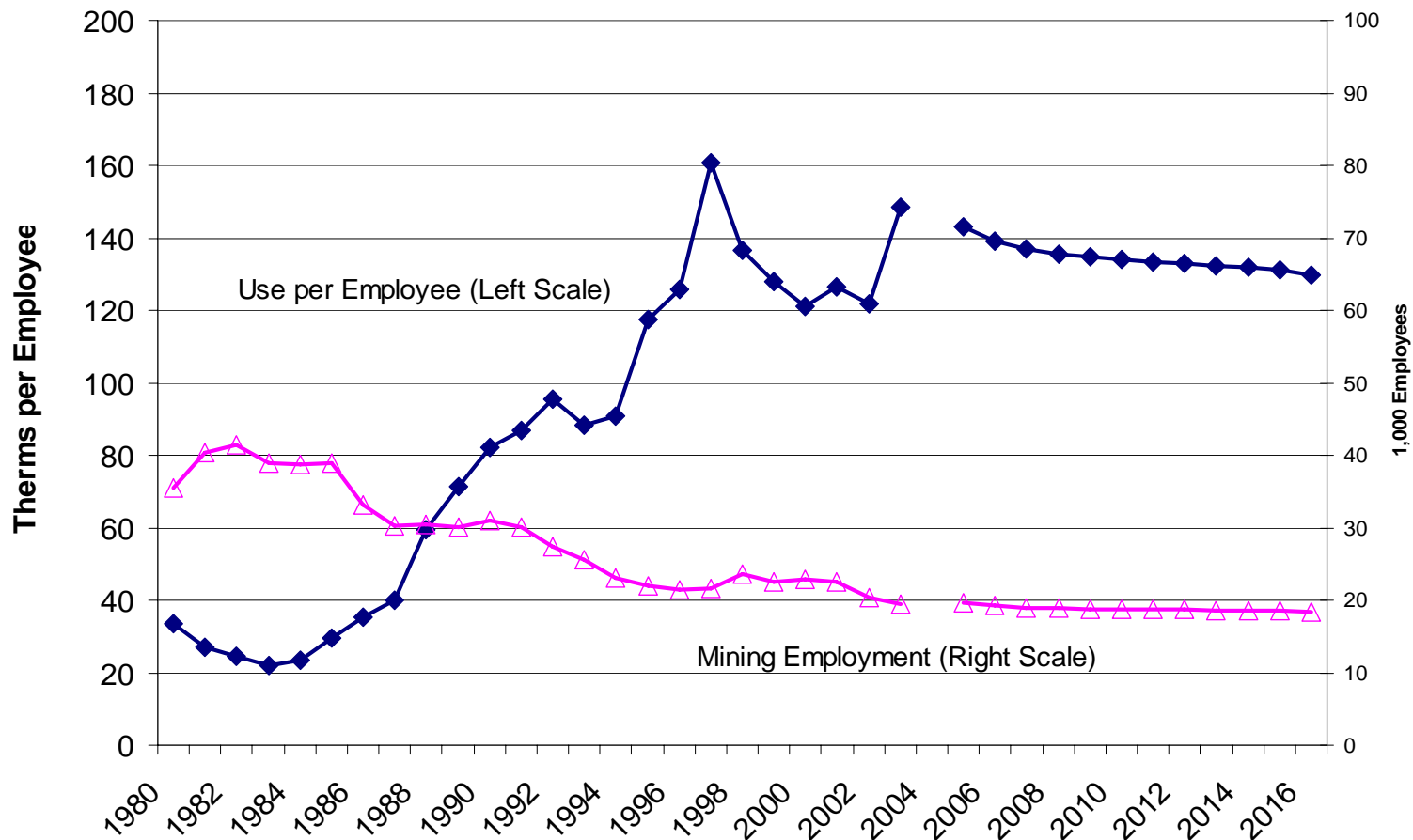
Industrial Natural Gas Intensity





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Mining Natural Gas Intensity





Natural Gas Demand



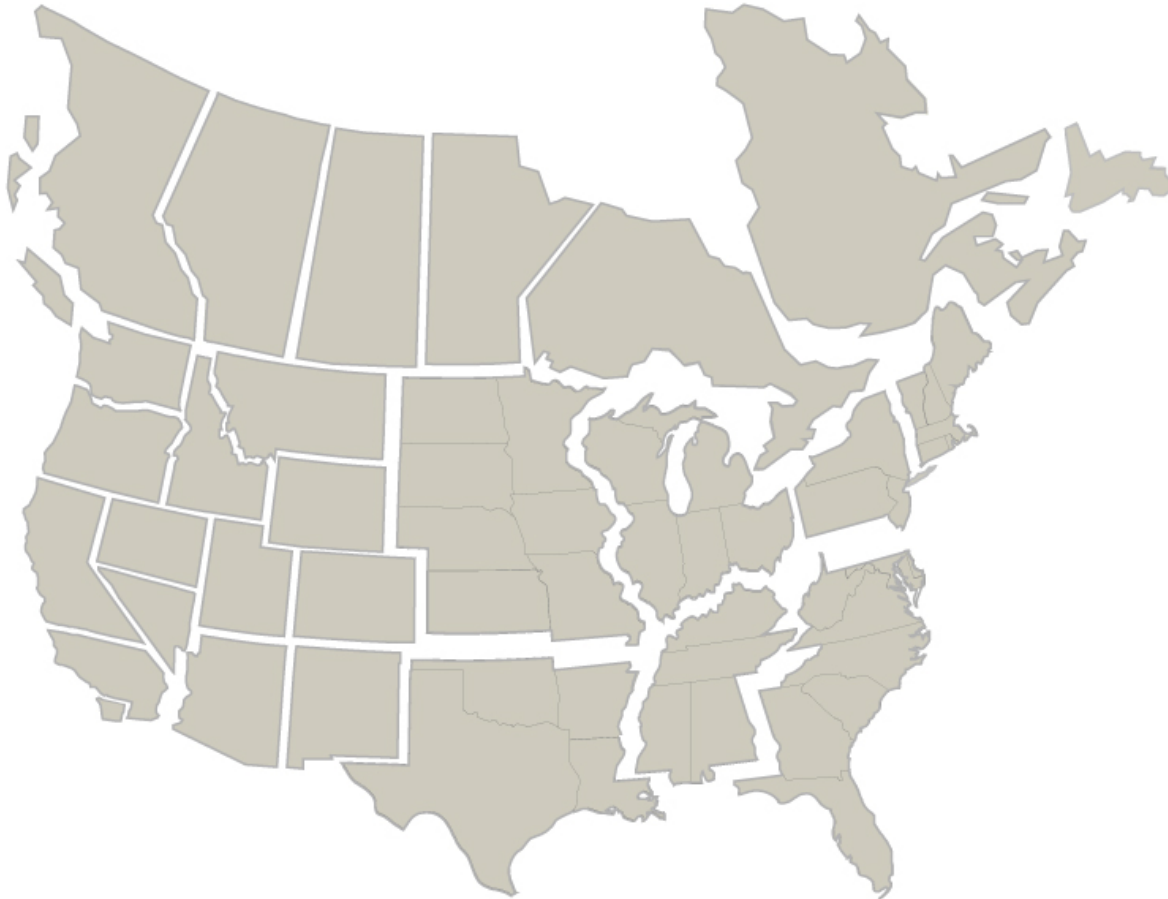
Today's Workshop Discussion

- Regions Covered by the Energy Commission's Natural Gas Demand Forecast
- Natural Gas End Use Sectors
- The Demand Modeling Process
 - Elastic vs. inelastic demand nodes
 - Residential and commercial gas demand methodology
 - Industrial gas demand methodology
 - Elasticity parameters used in each sector
 - Power generation gas demand methodology
- Natural Gas Demand Outlook: 2006-2016



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Demand Regions in the 2005 Natural Gas Market Assessment





End Use Demand Sectors

Sub-Regions in the U.S. and Canada

- Residential Demand
- Commercial Demand
- Industrial Demand
 - Chemical manufacturing
 - Non-chemical manufacturing
 - Thermally enhanced oil recovery (California only)
 - Bitumen extraction and upgrading (Alberta only)
- Power Generation Demand
- Total Demand (Alaska only)
- Asian Demand (Alaska only)

Sub-Regions in Mexico

Total Demand



The Demand Modeling Process

Elastic Demand Nodes

- Residential
- Commercial
- Industrial
 - Chemical manufacturing
 - Non-chemical manufacturing

Inelastic Demand Nodes

- Power Generation
- Oil Sands Extraction and Upgrading
- Process Heat for Thermally Enhanced Oil Recovery
- All Aggregated Demand Nodes (Alaska, Mexico, Asia)



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The Demand Modeling Process – Residential and Commercial Natural Gas Demand

Residential and commercial natural gas demand are functions of:

- Income
- Population
- Heating Degree Days
- Price of Natural Gas



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The Demand Modeling Process – Industrial Natural Gas Demand

- Broken into demand for chemical manufacturing and all other manufacturing processes
- Chemical and non-chemical industrial demands are functions of:
 - Industrial production
 - Cross price elasticity
 - Price of natural gas



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The Demand Modeling Process – Elasticity Parameters for Each End Use Sector

	SECTOR			
	Residential	Commercial	Industrial	Chemicals
<i>Own Price(t,i)</i>	-0.2270	-0.2104	-0.0919	-0.2903
<i>standard error</i>	0.0234	0.0284	0.0242	0.0681
<i>Cross Price(t,i)</i>			0.0251	0.0734
<i>standard error</i>			0.0227	0.0227
<i>GDP(t)</i>	0.1559	0.4000		
<i>standard error</i>	0.0330	0.0645		
<i>Industrial Production(t)</i>			0.0368	0.2522
<i>standard error</i>			0.0171	0.0967
<i>Heating Degree Days(t,i)</i>	0.5175	0.2913		
<i>standard error</i>	0.0314	0.0391		
<i>Population(t,i)</i>	0.7807	0.1776		
<i>standard error</i>	0.0623	0.0667		
<i>Q(t-1,i)</i>	0.2398	0.4658	0.4467	0.6836
<i>standard error</i>	0.0426	0.0731	0.0077	0.0107
<i>R²</i>	0.9327	0.9568	0.9958	0.9937



The Demand Modeling Process – Natural Gas Demand for Electricity Generation

Demand elasticity in the electricity generation sector is handled structurally, rather than econometrically.

- **There is insufficient data to create an accurate econometric model**
- **The power market has undergone a structural shift over the past several years, with gas-fired stations playing a greater role as a baseload resource**
- **The gas model generates prices, which are used as an input to the electricity model. The electricity model is then used to create a fuel use forecast for the gas model. Several iterations are made between the two models before arriving at a final fuel use forecast.**

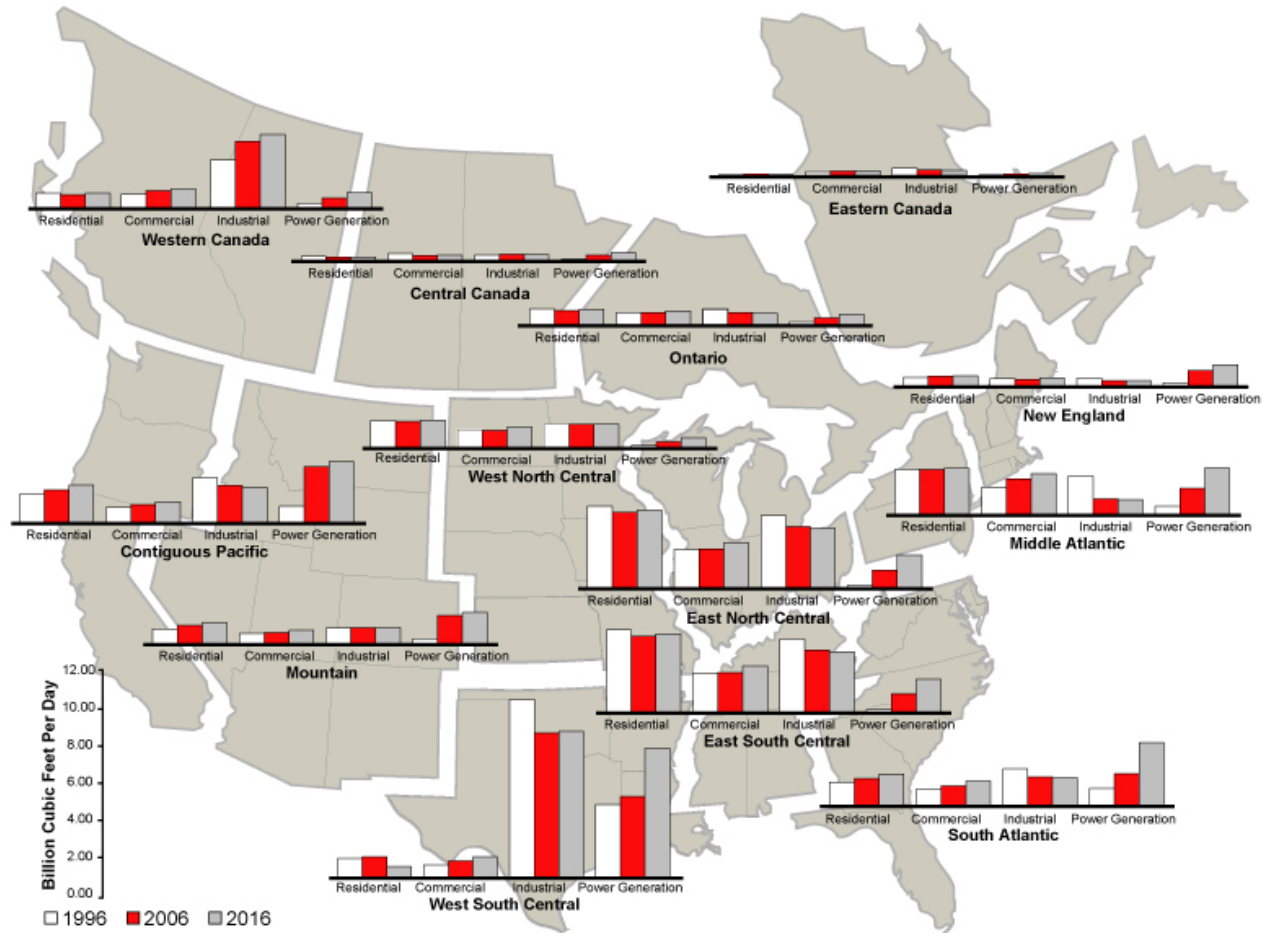


2006-2016 Natural Gas Demand Outlook



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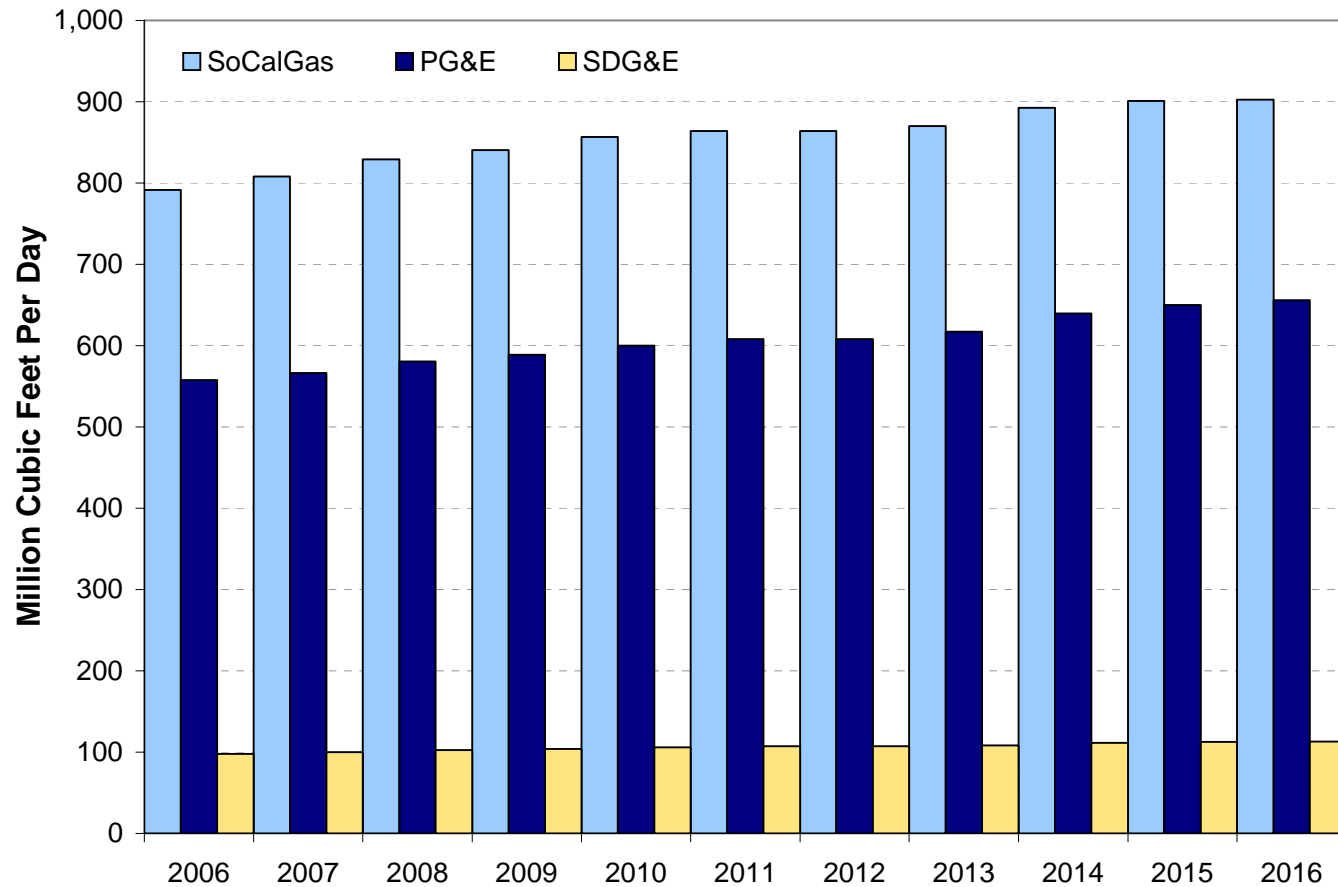
Natural Gas Demand Outlook: 2006-2016





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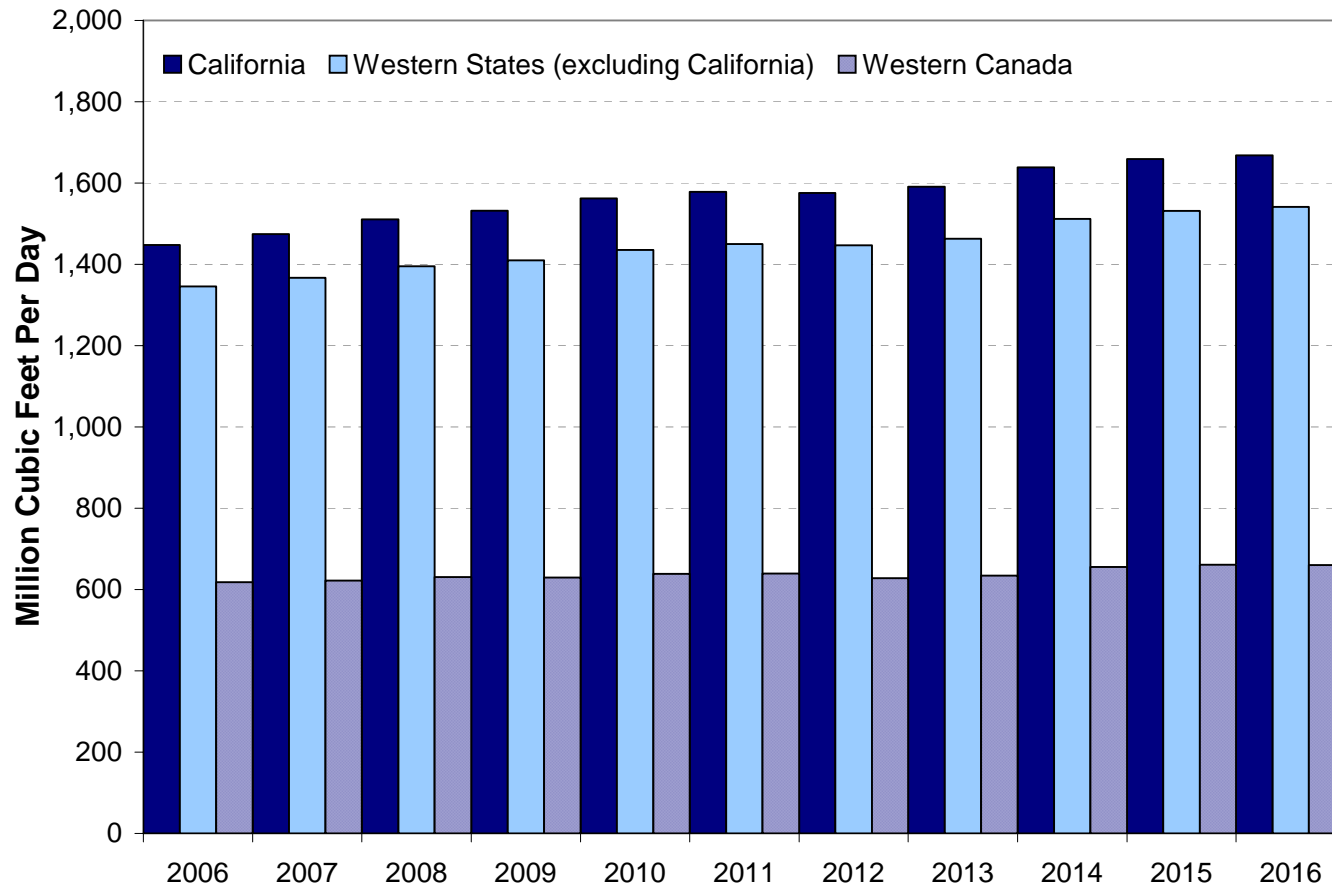
Projected Residential Natural Gas Demand in California





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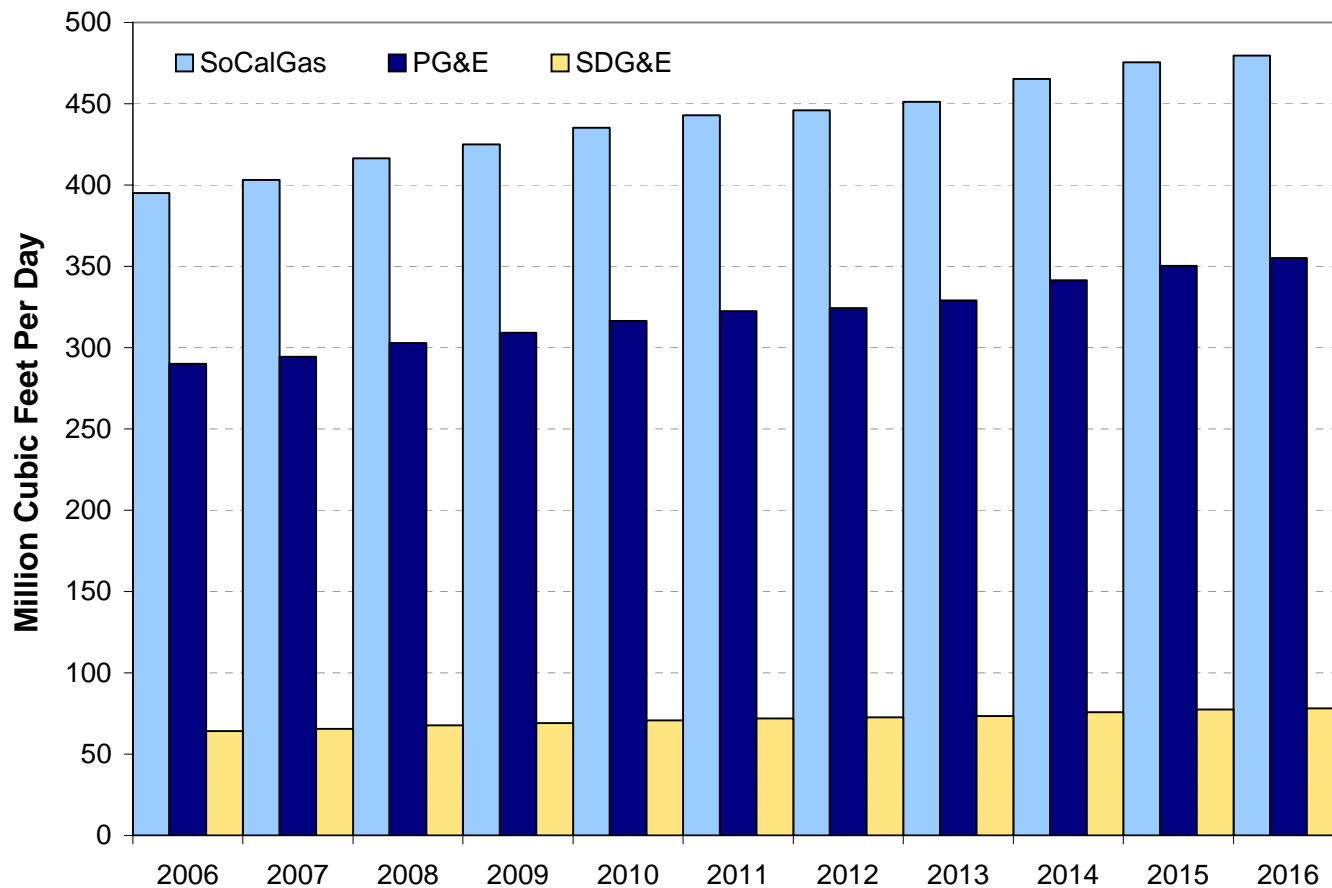
Comparison of Projected Residential Natural Gas Demand in the West





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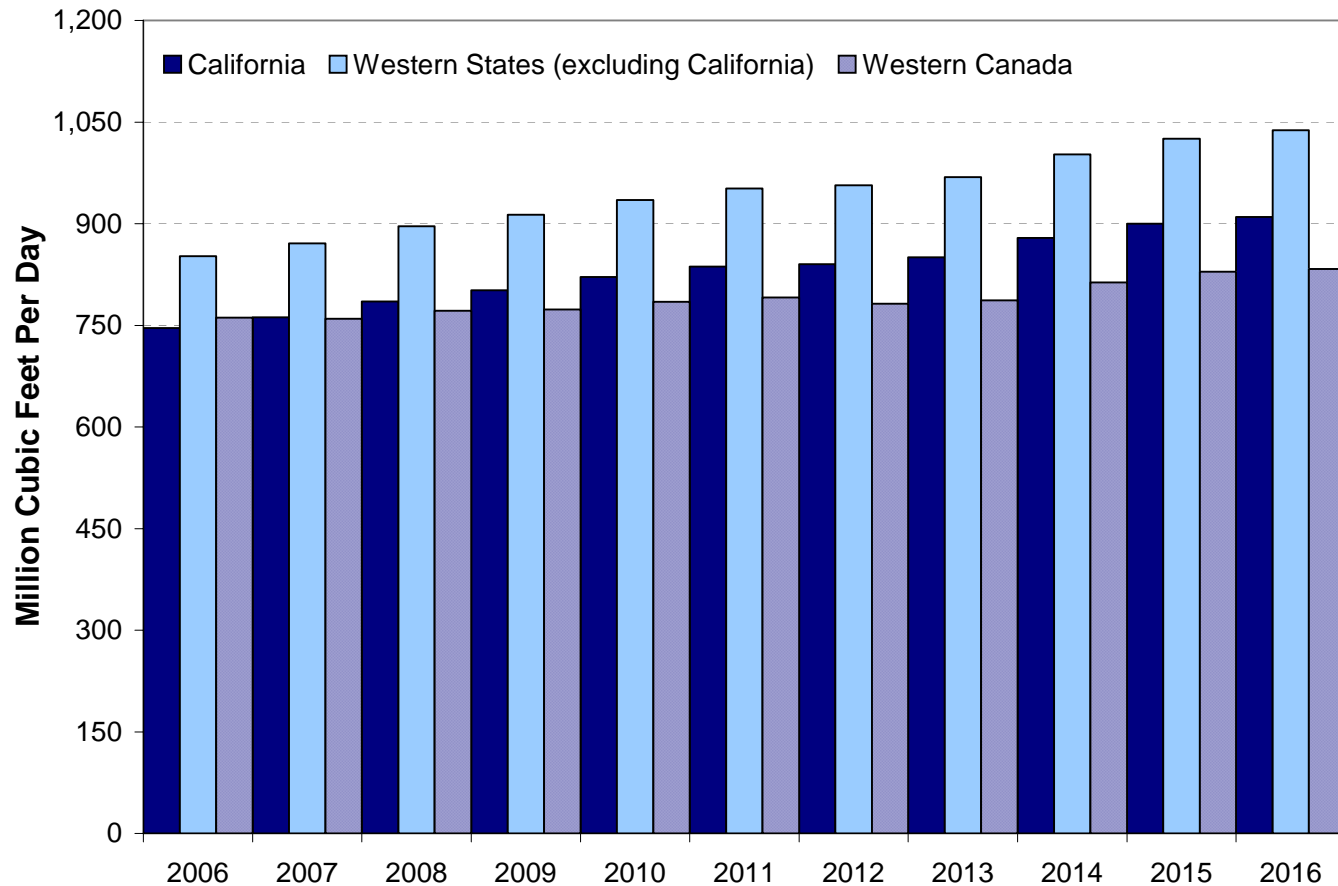
Projected Commercial Natural Gas Demand in California





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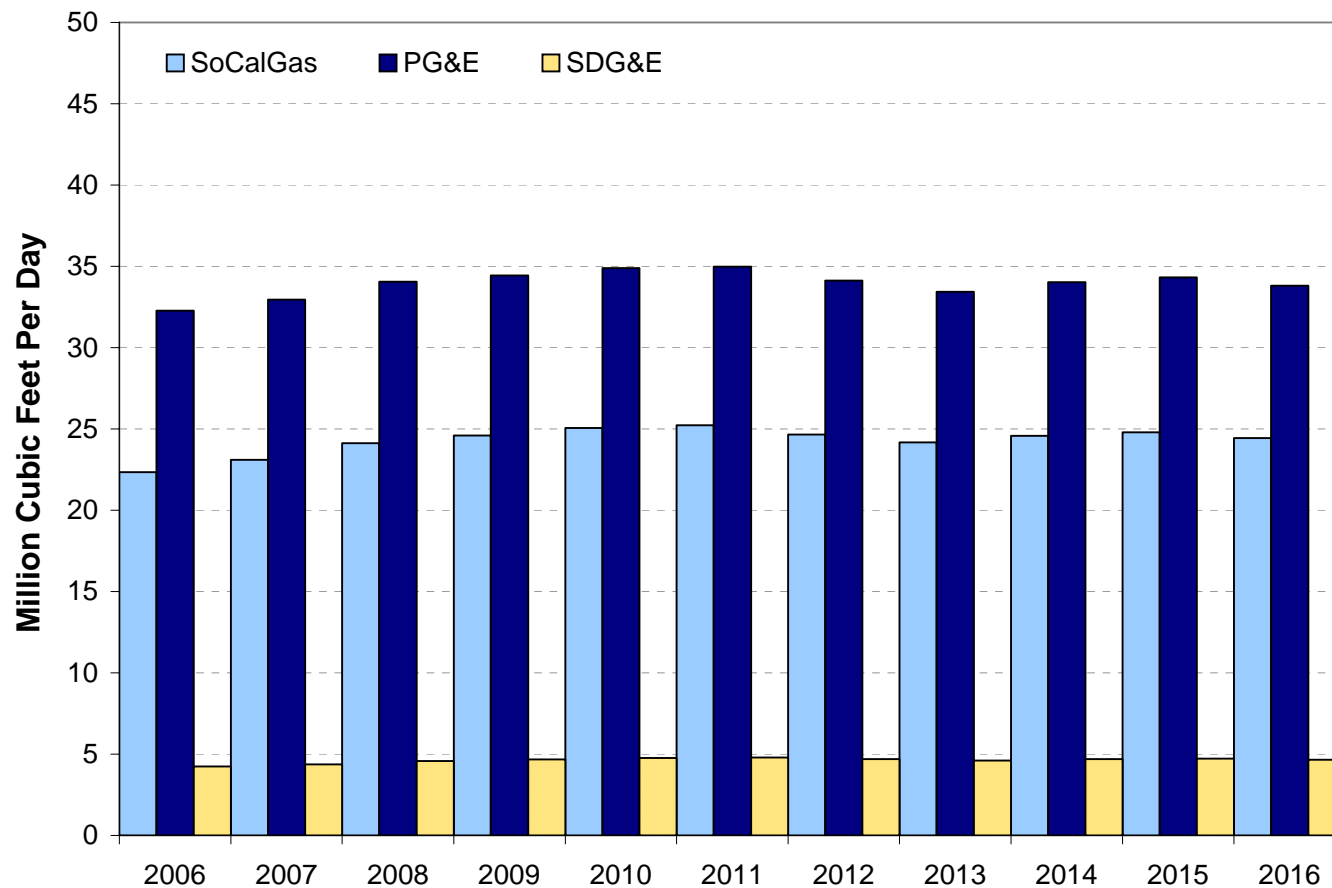
Comparison of Projected Commercial Natural Gas Demand in the West





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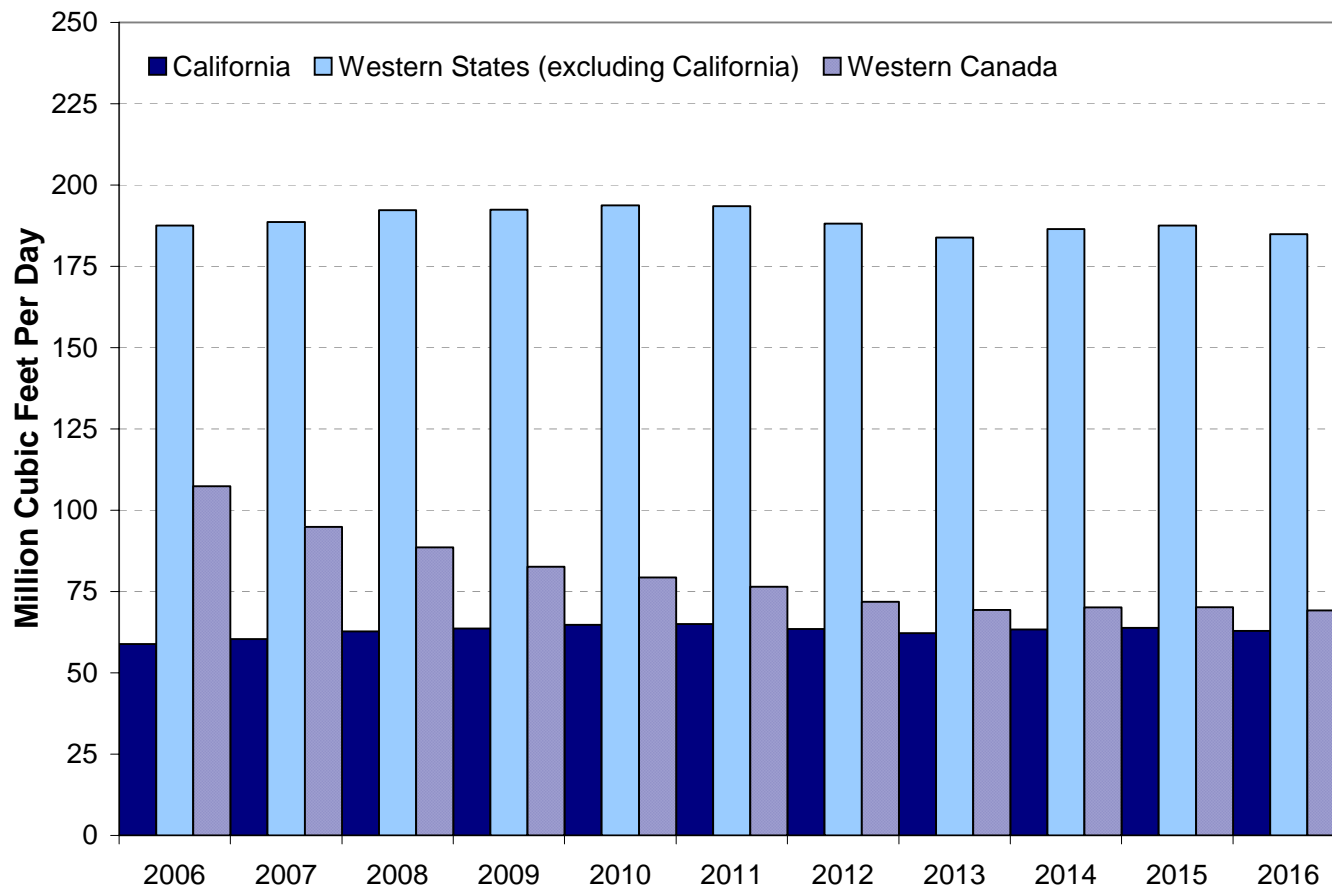
Projected Natural Gas Demand for Chemical Manufacturing in California





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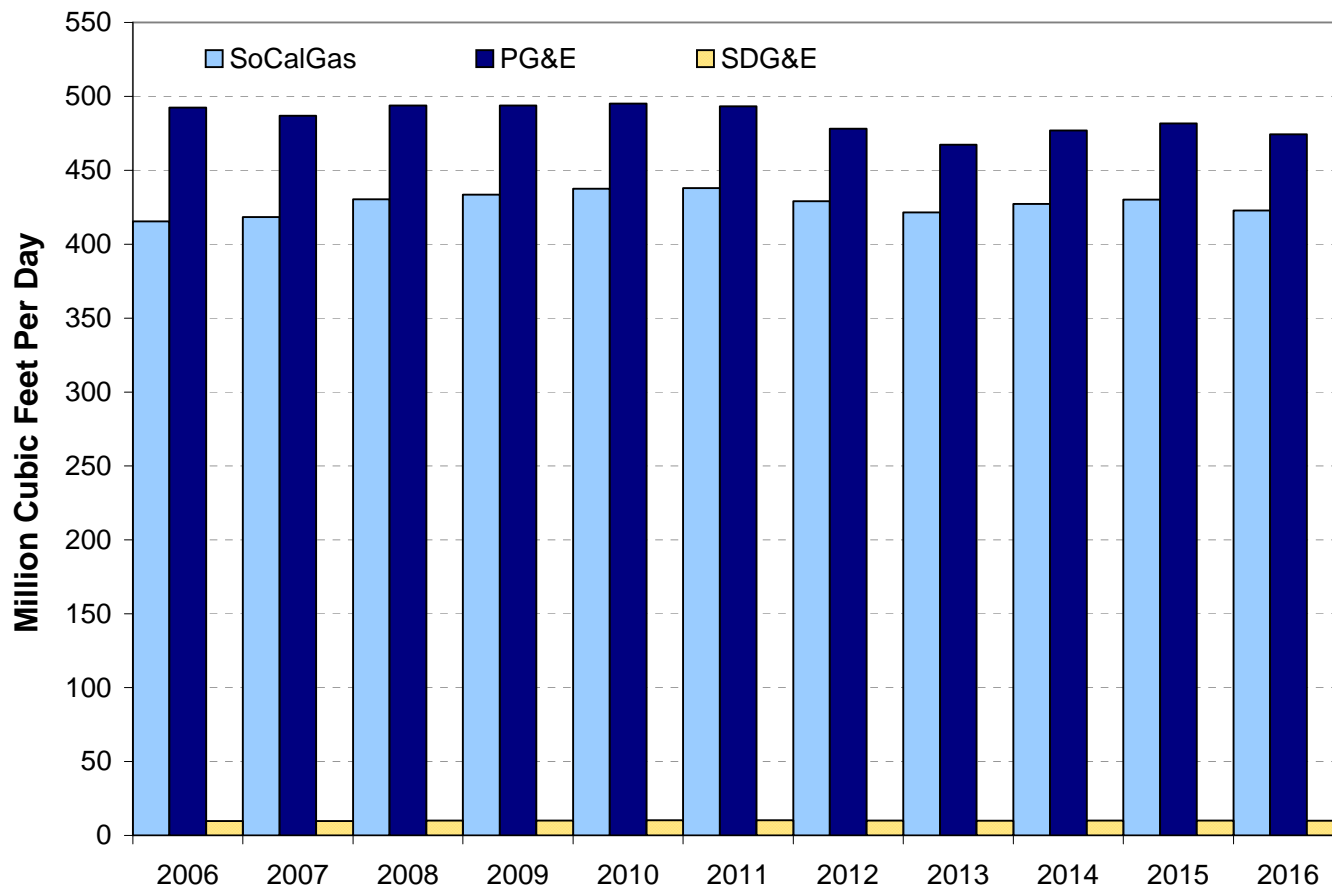
Comparison of Projected Natural Gas Demand for Chemical Manufacturing in the West





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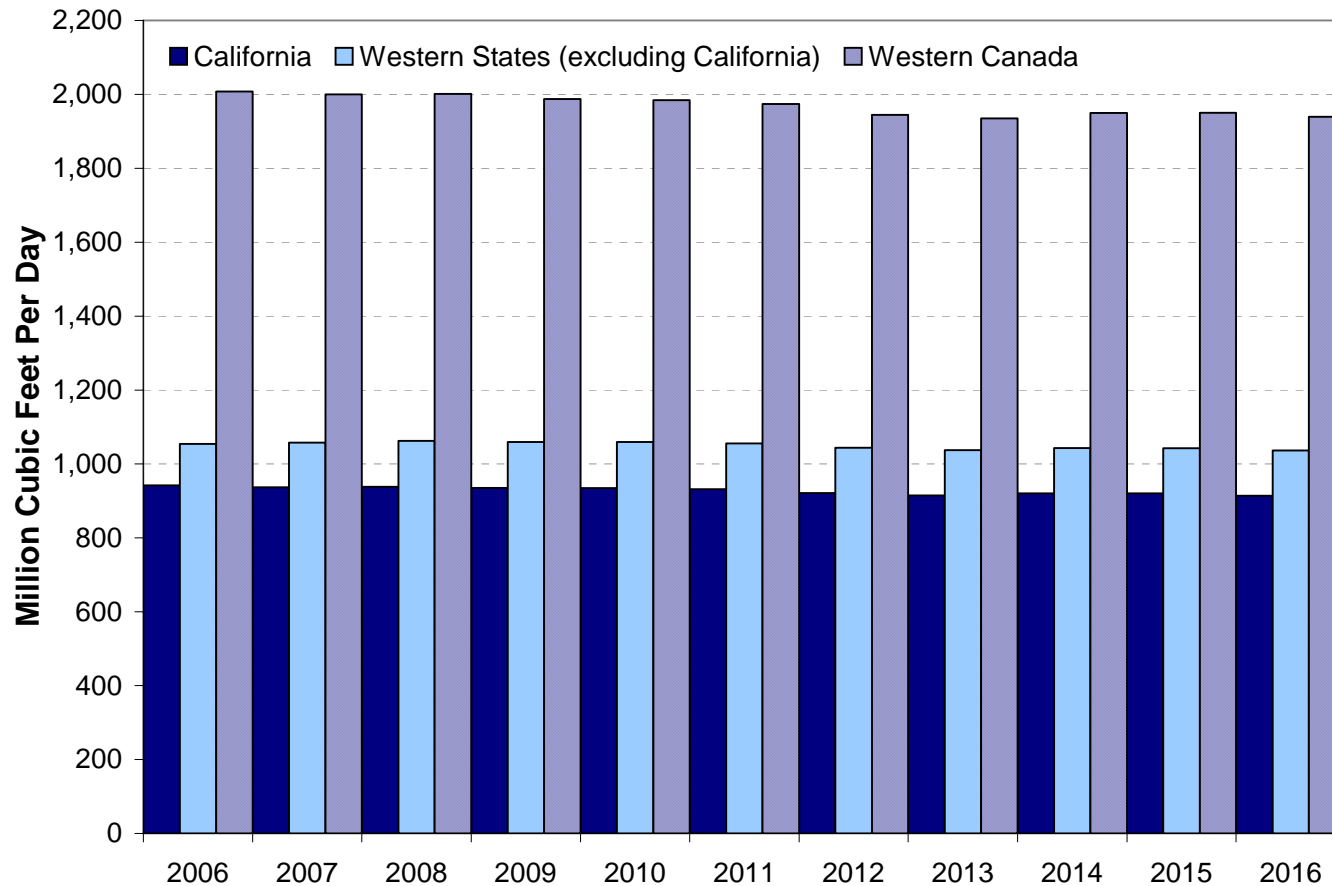
Projected Natural Gas Demand for Non-Chemical Manufacturing in California





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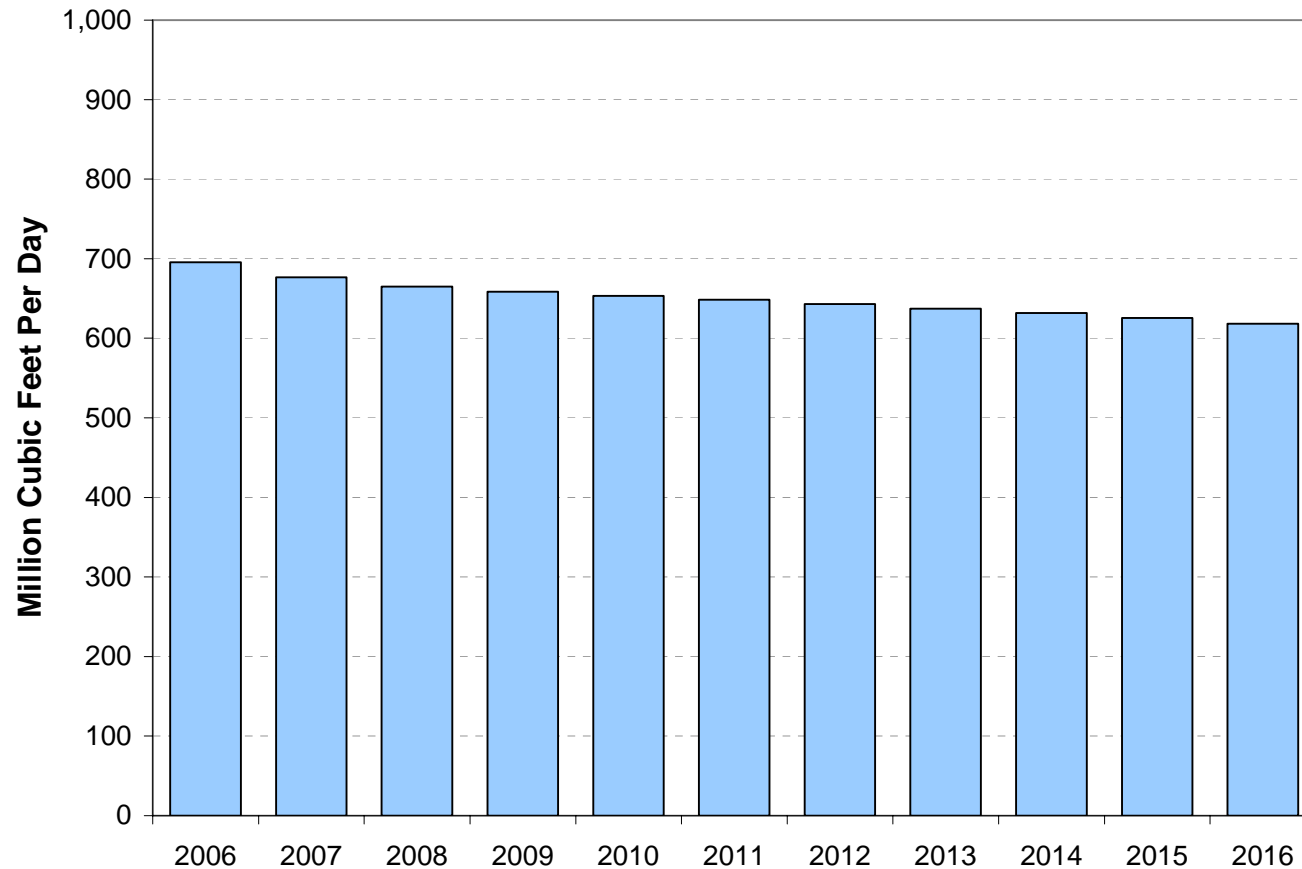
Comparison of Projected Natural Gas Demand for Non-Chemical Manufacturing in the West





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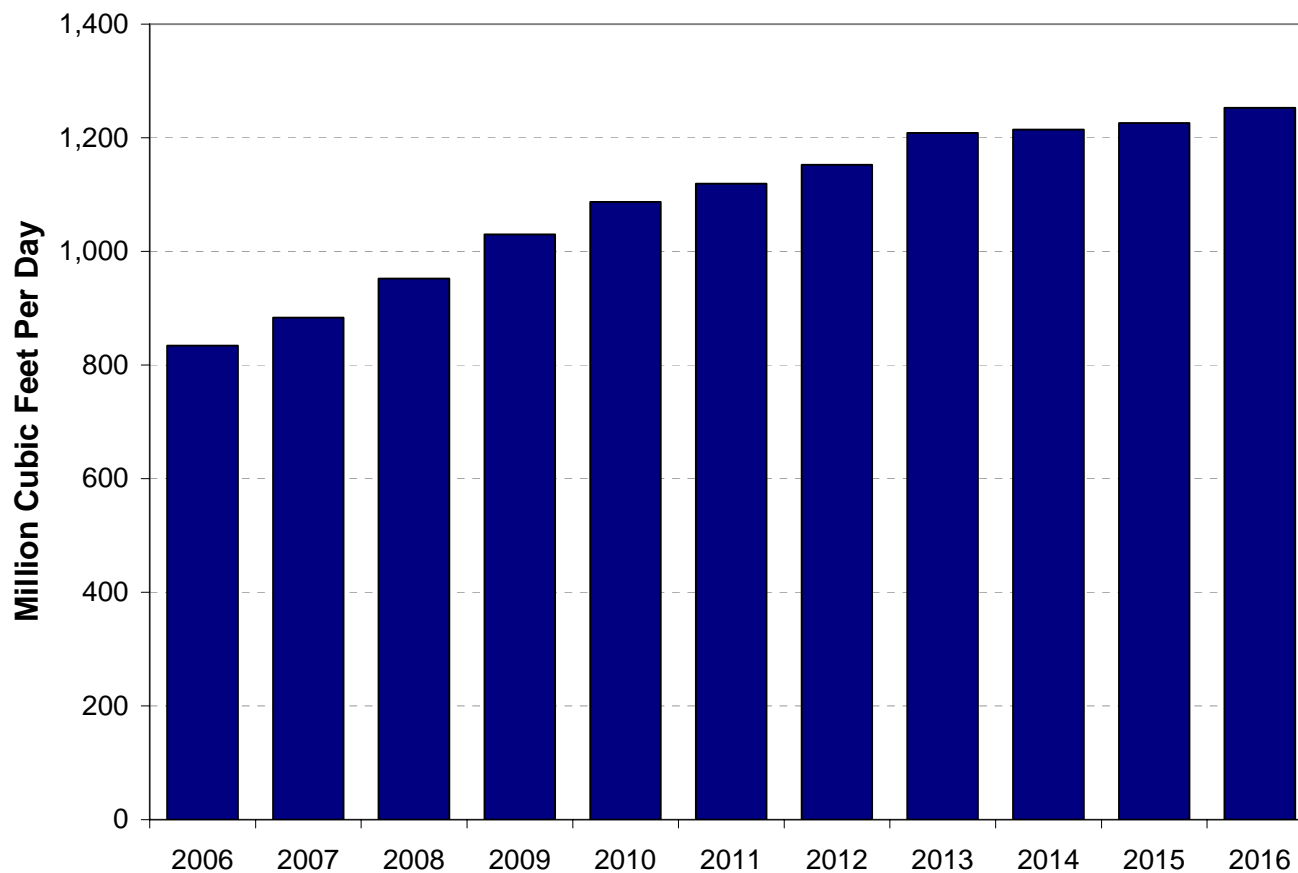
Projected Non-Cogeneration Natural Gas Demand for Thermally Enhanced Oil Recovery in California





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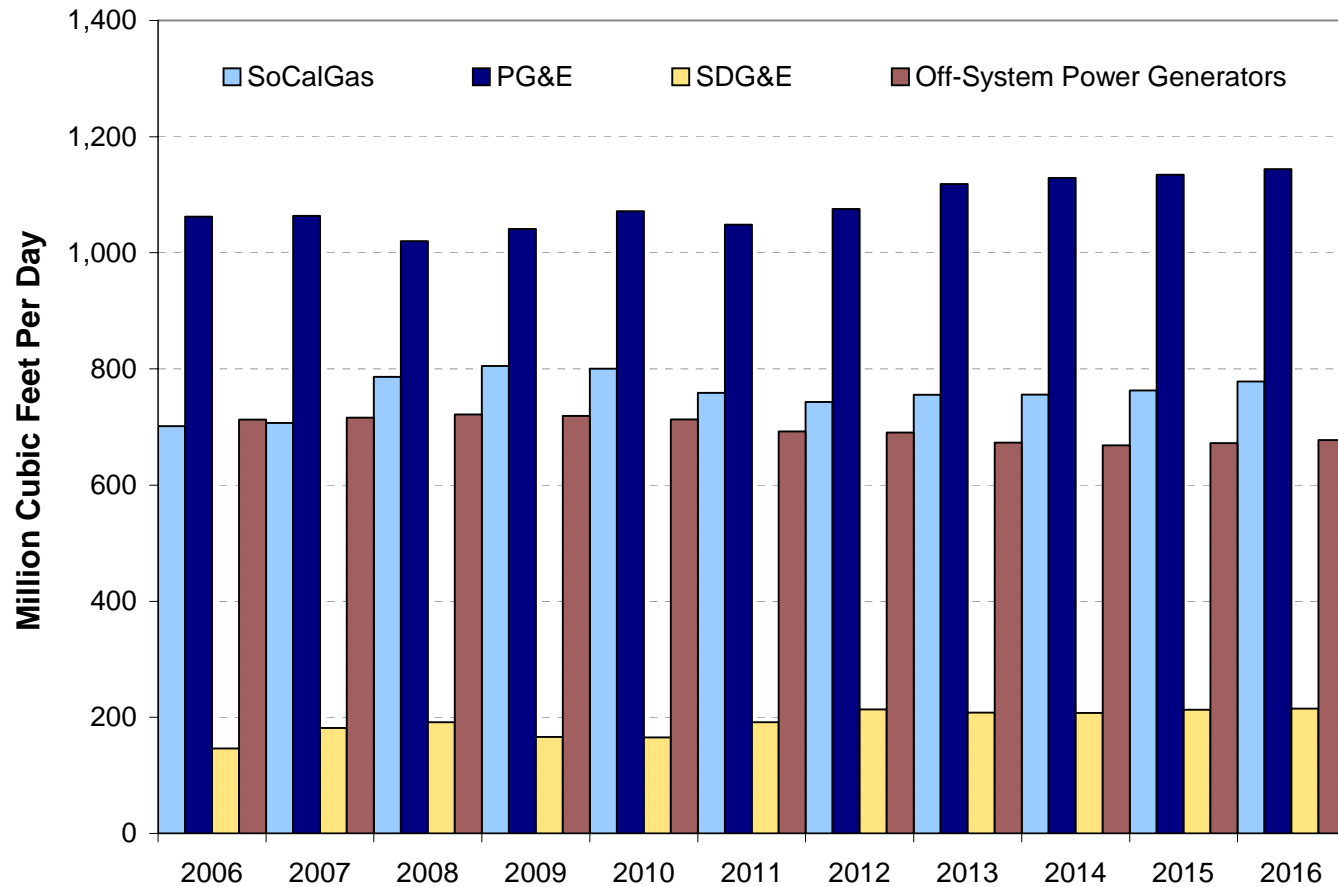
Projected Natural Gas Demand for Bitumen Extraction and Upgrading in Alberta





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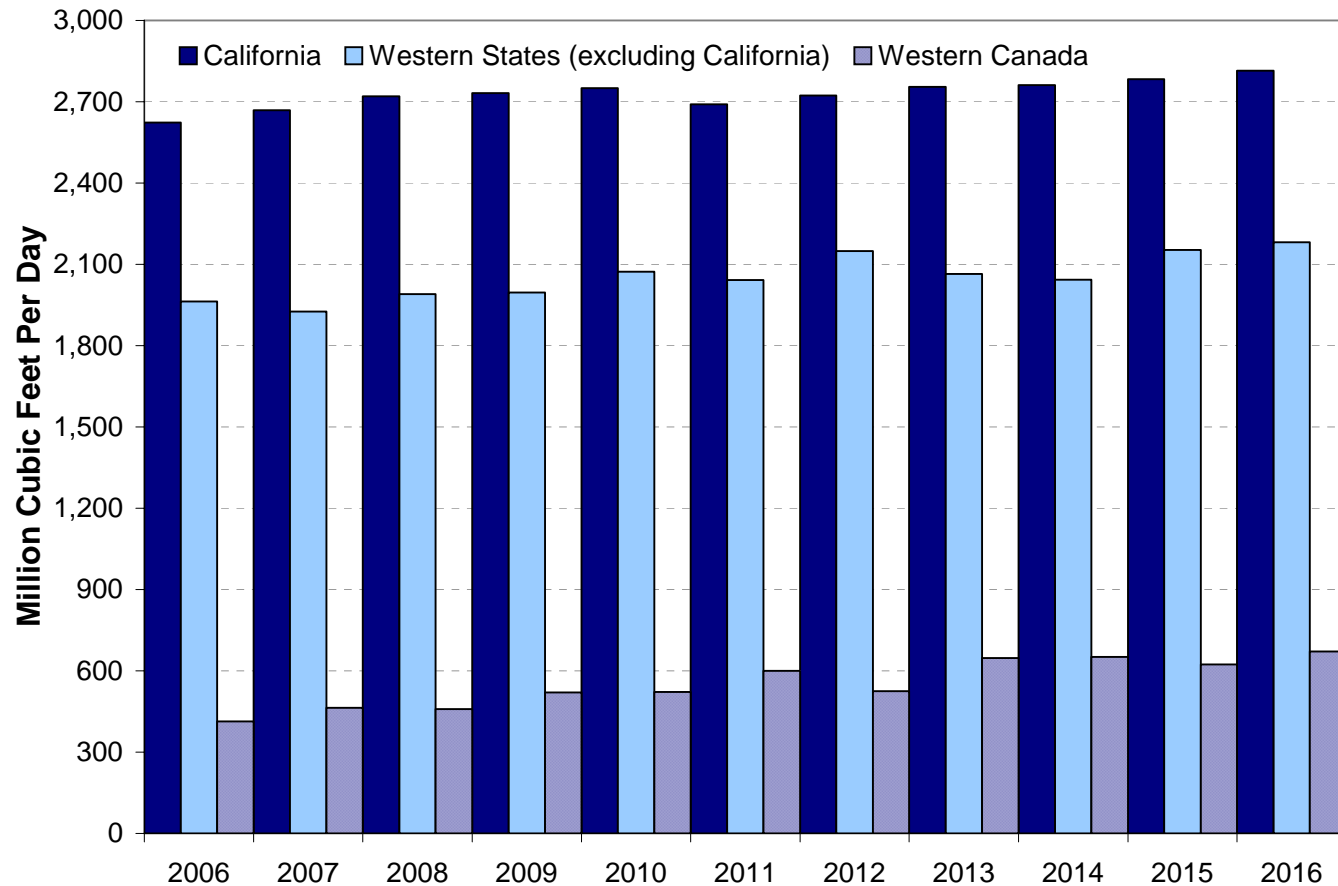
Projected Natural Gas Demand for Electricity Generation in California





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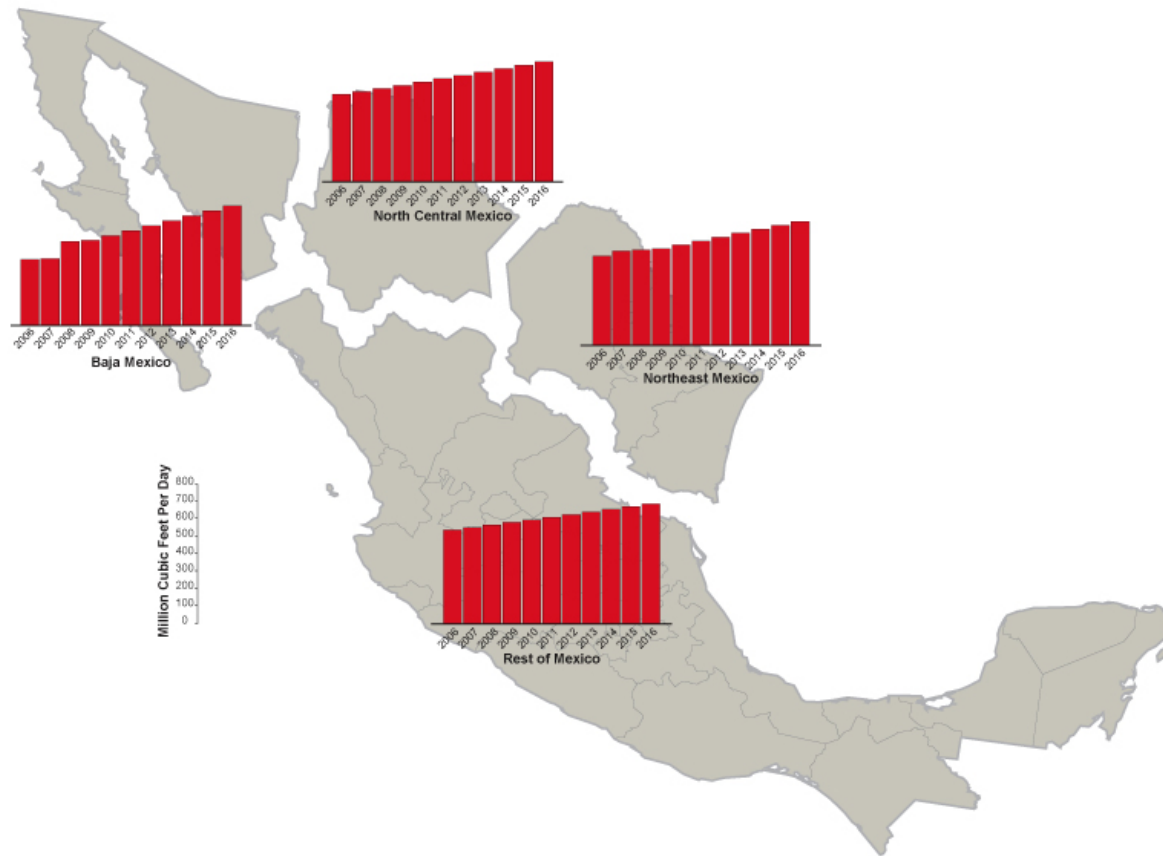
Comparison of Projected Natural Gas Demand for Electricity Generation in the West





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Projected Natural Gas Demand in Mexico





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Any questions.....?



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